



## **Description and Objectives**

- Mo and W possess the high temperature properties needed for containment cartridges and cost an order of magnitude less than currently used materials, i.e., Nb and Ta.
- Near-net-shape manufacturing methods, i.e., Vacuum Plasma Spray (VPS) forming, must be used, when making thin-walled, closed-end Mo and W alloy tubes.
- Pre-alloyed Mo and W powders are needed to optimize the properties of Mo and W alloy containment cartridges.

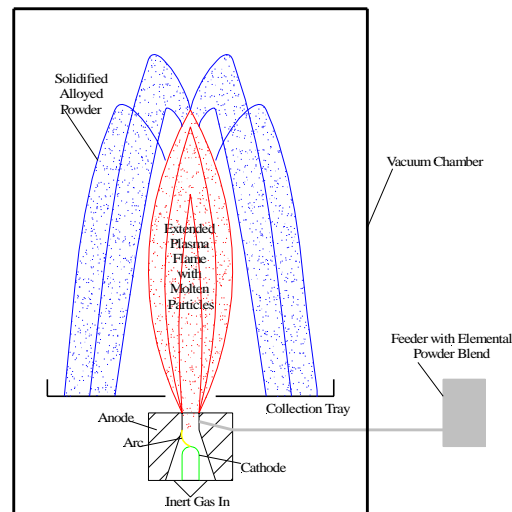


Figure 1 – Schematic of the plasma alloying process to be developed for making pre-alloyed W and Mo powders. A typical VPS forming flame is ~180mm long. The plasma alloying flame will be 540-720mm long; thus, increasing the time of flight for particles 3 to 4 times. The increased time and plasma temp. (>16,000°C) should be sufficient for alloying the micron size powders.

## **Approach**

- The plasma alloying process (Fig. 1) will be developed for producing pre-alloyed Mo and W powders.
- Mo and W alloyed powders will be produced.
- Analysis will be conducted to ensure complete alloying has occurred.
- Spray formed samples will be produced for hermiticity and mechanical properties testing.
- The effect of high temperature heat treatments (>1500°C) on the microstructure of samples will be determined.

## **Subcontractor**

None

## **Schedule and Deliverables**

- 6 months for development of the plasma alloying process, fabrication of test articles, and characterization.
- Results of powder characterization.
- Hermiticity and mechanical testing results.
- If desired by the COTR, samples for compression testing at NASA.

## **NASA and Commercial Applications**

- Cartridges that are less expensive than Nb and Ta.
- Potential for the development of a containment cartridge that can used to ~2500°C.
- Rocket motors, heat pipes, power generation, furnaces